

DOCUMENT RESUME

ED 118 257

95

PS C03 352

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TITLE Teacher Education, Teacher Effectiveness, and Developmental Psychology. Report No. 75-15.
INSTITUTION Texas Univ., Austin. Research and Development Center for Teacher Education.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
PUB DATE Aug 75
CONTRACT NIE-C-74- 089; OEC-6-10-108
NOTE 32p.; Paper presented at the Annual Meeting of the American Psychological Association (83rd, Chicago, Illinois, August 30 - September 3, 1975)

EDRS PRICE MF-\$0.83 HC-\$2.06 Plus Postage
DESCRIPTORS *Child Development; Cognitive Development; Curriculum Planning; Educational Philosophy; *Effective Teaching; *Elementary Education; Social Class; *Teacher Characteristics; *Teacher Education; Teaching Methods; Teaching Styles
IDENTIFIERS *Texas Teacher Effectiveness Study

ABSTRACT

This paper presents some of the major findings of the Texas Teacher Effectiveness Study, an investigation of the teacher characteristics that correlate with ability to produce student learning gain. In addition to general information about the study and its findings, specific attention is drawn to contrasts between optimal behavior in low SES and high SES schools, and contrasts between findings expected on the basis of previous theory and research and findings which failed to confirm expectations or even contradicted them. Analysis of these two sets of contrasts suggests an interpretation based upon considerations drawn from developmental psychology (particularly the distinction between Piaget's preoperational stage versus his concrete operational stage) and from an analysis of differences between the teaching-learning situation in grades 1-3 versus the teaching-learning situation in later grades. The data and these interpretations suggest several implications for how the act of teaching should be conceptualized and how future teachers should be educated. Some of these implications conflict with popular theories and beliefs concerning the nature of effective teaching, the structure of teacher education programs, and the implications of research on cognitive development for curriculum and methods in the early elementary grades. (Author)

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Teacher Education, Teacher Effectiveness,
and Developmental Psychology

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Report No. 75-15

Research and Development Center for Teacher Education

This report is an expanded version of a paper entitled "Teaching the Preoperational Child," delivered at the annual meeting of the American Psychological Association, Chicago, Illinois, 1975.

PS 008352

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Teacher Education, Teacher Effectiveness
and Developmental Psychology

Abstract

This paper presents some of the major findings of the Texas Teacher Effectiveness Study, an investigation of the teacher characteristics that correlate with ability to produce student learning gain. In addition to general information about the study and its findings, specific attention is drawn to contrasts between optimal behavior in low SES versus high SES schools and contrasts between findings expected on the basis of previous theory and research versus findings which failed to confirm expectations or even contradicted them. Analysis of these two sets of contrasts suggest an interpretation based upon considerations drawn from developmental psychology (particularly the distinction between Piaget's preoperational stage versus his concrete operational stage) and from an analysis of differences between the teaching-learning situation in grades 1-3 versus the teaching-learning situation in later grades. The data and these interpretations suggest several implications for how the act of teaching should be conceptualized and how future teachers should be educated. Some of these implications conflict with popular theories and beliefs concerning, among other things, the nature of effective teaching, the structure of teacher education programs, and the implications of research on cognitive development for curriculum and methods in the early elementary grades.

Teacher Education, Teacher Effectiveness, and Developmental Psychology

For several years, we and our colleagues have been investigating teacher effectiveness, observing in classrooms. In an attempt to answer the question "What characteristics differentiate effective teachers from less effective teachers?" These investigations have included a two-year replicated observational study of teaching in second and third grade classrooms, a follow-up one year experimental study of teaching in first grade reading groups, a one year study of teaching in seventh and eighth grade English and math classrooms, and a series of studies on teacher perceptions of students and the relationships between these perceptions and teacher-student interaction and student outcome measures. The main findings of our two-year study of second and third grade teachers are reported in our recent book, Learning from Teaching: A Developmental Perspective.¹ The present article focuses on these findings and in particular on their implications for the way we conceptualize elementary school teaching and on the implications that research in developmental psychology and in teacher effectiveness have for revision of these conceptualizations and for possible revision of teacher education programs.

Teacher Effectiveness Research

A great many investigators have conducted teacher effectiveness research by observing classroom interaction and attempting to relate their process data

to measures of student learning or other student outcome measures (attitudes, etc.). Until fairly recently, great effort in this area had led to very little payoff. However, recently there has been a convergence of findings showing that certain teacher characteristics are consistently (although not very strongly) related to measures of student learning gains.^{2,3} Variety in curriculum presentation methods, student opportunity to learn, teacher enthusiasm, teacher clarity, teacher warmth, a high level of complexity of teacher questions, and teacher task orientation have all shown positive relationships with student learning gains, while teacher criticism has consistently shown negative relationships. Variables involved in the method of indirect teaching as proposed by Flanders⁴ (maximal questioning and minimal lecturing; maximal pupil-pupil-interaction; minimal lecture and maximal discussion; stress on independent student learning, and frequent praise and use of student ideas) have shown consistently positive relationships with student attitudes and less impressive but still positive or curvilinear relationships with measures of student learning. Investigations of teaching based on concepts of individualized instruction, mastery learning, or applied behavior analysis also have been promising.

Analysis of earlier work revealed several difficulties which probably contributed to its limited success. First, remarkably little was conducted in naturalistic classrooms. Much so called "educational research" was conducted in laboratory situations using standardized programmed materials as stimuli and college students as subjects, and yet the findings often were generalized to elementary students being taught by teachers. Also, many of the investigations which did use teachers used student teachers or new teachers. These individuals

are changing their behavior almost daily as they acquire new skills, so that classroom observational data taken from them are likely to be highly unreliable. Criteria are another problem. Although few would argue that student learning is the only criterion of teacher effectiveness, remarkably few studies of "teacher effectiveness" involved any attempt to measure student learning. Finally, only a small portion of the studies which did attempt to measure student learning also measured teacher behavior (many were confined to questionnaire methods or other non-observational data collection), and most of those which did involve measuring teacher behavior used brief observations and over-simplified measures. Thus, in retrospect, perhaps it is not surprising that such research yielded so little. Recent advances have come about primarily because investigators have begun to develop more sophisticated observational techniques, to collect data under more appropriate conditions, and to relate these data to more appropriate criteria.

The Texas Teacher Effectiveness Project

Our two-year study of second and third grade teachers, called the Texas Teacher Effectiveness Project, was an attempt to combine several of the advances which have appeared quite recently, along with a few more of our own, in order to carry out research which hopefully would provide more definitive answers to some of the teacher effectiveness questions raised in the past. The study was restricted to teachers who had worked at their respective grade levels (second or third) for at least five years prior to data collection, and who also had shown unusually high stability across three consecutive years and five subtests of the Metropolitan Achievement Tests in their degree of success in

producing student learning gains on this test. Thus, the teachers in the sample were both experienced and relatively stable, compared to some of their peers, in the student learning gains that they produced. Once the sample was identified and recruited, teachers were observed in the classroom with a multifaceted low inference coding system and were rated on numerous other variables by the classroom observers at the end of the year. In the first year of the study, thirty-one teachers were involved, 13 in low SES schools and 18 in high SES schools. Nineteen of these were retained for study in the second year, with 12 being lost due to retirement, maternity leave, transfer to a different grade, or, in a few cases, refusal to continue in the study. These were replaced with nine new teachers having the same general characteristics as the others so that in the second year there were a total of 28 teachers, 13 in low SES schools and 15 in high SES schools.

Teachers were observed for about ten hours each in the first year and for about 30 hours each in the second year. In addition to the classroom process data picked up through low inference coding and high inference rating by the classroom observers, the teachers in the second year were interviewed to obtain their beliefs and attitudes about teaching and to obtain information about matters that could not be observed directly (out-of-classroom planning, construction and use of tests, preparation for individualized instruction, etc.). Altogether, over 2,000 measures were taken on each teacher, and each of these measures was related to measures of student learning gain through both linear correlational analyses and non-linear curve fitting analyses. The criteria of teacher effectiveness were five mean residual gain scores obtained by averaging the residual gains of the children in each teacher's class on each of the five

subtests for which data were available (word knowledge, word discrimination, reading, arithmetic computation, and arithmetic reasoning) across the four years of study for which data were available (a fourth year of data was available by this time).

The study had several important features which, in combination, made it especially likely to come up with definitive findings. First, as mentioned, the teachers were both experienced and consistent in their records of producing student learning gains on these standardized tests. Also, several contextual factors were systematically taken into account in analyzing the data. Student ability factors were handled by residualizing the scores rather than using raw gain scores, so that teachers in low SES schools would not be penalized. The possibility that different teaching techniques would be appropriate at the same grade level in different SES schools was taken into account by separating these groups for analysis. Several different contextual factors were taken into account in the coding system: morning versus afternoon instruction; reading group instruction versus whole class instruction; teacher initiated versus student initiated contacts; work related versus procedural versus behavioral contacts. More complete details about the methodology of the study are given in our book⁵ and in numerous reports available in ERIC.

The present article will deal with only a subset of the findings, those which were among the more important and consistent and which have the most interesting implications for teacher education. All of these were significantly related to measures of student learning in both years of our study (with the exception of the teacher interview data, which were available only for the second year of the study and thus were not replicated). The teacher characteristics

which correlated with student learning gains will be discussed as general aspects of teacher effectiveness, because variables tended to correlate in similar fashion to all five of the criterion scores. No doubt this was partially due to the fact that we had selected teachers in the first place on the basis of their general effectiveness across time and across all five of the subtests. However, analyses conducted during the process of this selection had revealed that almost all teachers were similar in their relative effectiveness in teaching the language arts material as compared with their relative effectiveness in teaching the mathematics material. Only two or three of the original sample of 165 teachers showed a clear cut pattern of greater success across time in language arts versus math or vice versa. Thus, it appears that teachers working in the early elementary grades tend to be general in their relative effectiveness as defined by their ability to produce learning gains in students.

Expected Findings

Many of the variables included in our research were included because previous research had suggested their importance, and our research replicated these earlier findings. Perhaps the most important set of findings had to do with classroom management abilities. Our research very strongly replicated the work of Kounin⁶ concerning effective versus ineffective classroom management, and carried it further by showing that teachers who were effective classroom managers also tended to get greater learning gains (as would be expected; students in well controlled classrooms will have a greater opportunity to learn than students in chaotic, uncontrolled classrooms). Precisely as Kounin had predicted,

we found that the most successful classroom managers were those who carefully prepared the classroom and the curriculum activities so that students always had assignments and activities to do and so that periods of boredom and confusion were minimized.

The more effective teachers in our study, as in his, ran smooth, well-paced lessons with few interruptions, and their students worked consistently on assignments. The smoothness of lessons was due primarily to good preparation. Lessons were interesting and well-paced, and teachers did not invite trouble by pausing to get things that should have been prepared earlier, "look something up, find a prop, etc. High student engagement in seatwork appeared to result from a combination of work which was appropriate to student ability levels and interesting enough to maintain student interest.

The more successful teachers also had "automatic" mechanisms to insure that students who needed help could get it with minimal difficulty and disruption. Usually they designated certain students as ones that others should go to for help when necessary. They also had a system to insure that the students knew what to do when they finished assignments. Activities had been prepared that students could go to voluntarily, and each one knew exactly what was and was not allowed. Thus, there was no disorder created by students who had finished assignments and were bored because they had nothing to do, and there was no continual harassment of the teacher with questions about whether or not a student could do something.

In contrast, the less successful classroom managers conducted boring or unevenly paced lessons because of frequent interruptions due to their own lack of preparation or to interruption by students, and their students often failed to work on seatwork assignments because assignments were inappropriate or because they had not been given sufficient directions. Also, upon finishing as-

signments, students in these classes tended to goof off, because they had nothing else to do.

Finally, the more successful classroom managers avoided the "ripple effects" that Kounin had observed in connection with teacher overreactions to behavioral problems. The successful classroom managers tended to respond to misbehavior with simple warnings, while less successful ones tended to become more emotionally aroused and respond with anger, severe personal criticism, or punishment. This tended to have an unsettling effect on the class as a whole, and to increase the probability of another behavior problem in the near future.

Within this general pattern, there were some school SES differences. Teachers working with low SES students were more successful if they kept a somewhat tighter control on things, placing more restrictions upon independent movement around the classroom and giving more structure concerning assignments. In contrast, the more successful teachers in high SES classrooms tended to allow much more freedom and independence concerning choice of activities and freedom of movement around the room, commensurate with the degree of responsibility and readiness for such independence that the students showed.

Another set of findings which had been expected concerned the teachers' attempts to modify the basic curriculum to meet the needs of their students. In general, learning proceeded most smoothly when it was relatively easy, so that the children could acquire new information without cognitive strain, but still difficult or new enough to provide some challenge and interest. As a result, measures of difficulty level of material related curvilinearly in an inverted-U fashion to measures of student learning. For the sample as a whole, learning was optimal when about 75% of the teachers' questions

were answered correctly. However, this figure varied up or down according to student SES (and, presumably, according to individual student abilities and achievement levels). Thus, the most successful teachers in high SES schools maintained a somewhat more challenging level of difficulty, so that about 70% of their questions were answered correctly. Conversely, the most successful teachers in low SES schools maintained a somewhat easier level, so that about 80% of their questions were answered correctly.

Data from several other measures also support the general finding that low SES students learned more when they were taught somewhat less but taught in smaller chunks and more redundantly to the point of overlearning, while higher SES students learned somewhat more when they were challenged with somewhat more difficult material. High SES children apparently responded well to difficulty and challenge (provided it did not induce too much cognitive strain), but low SES children responded much better to a slower pace and a concern for overlearning. These findings fit quite well with predictions based upon the writings of Cronbach⁷ and others who have discussed aptitude by treatment interactions.

There were consistent differences in expected directions on certain attitudinal and belief system variables which appeared in the teacher interview data. Briefly, as expected, the more successful teachers tended to have a more internal locus of control, leading them to assume more personal responsibility for their students' learning gains and general school experience, to believe that they could and would succeed in meeting their stated goals, to respond to frustrations with redoubled efforts and a tendency to find another way to reach the goal, and the like. In contrast, the less successful teachers

tended to have a more external locus of control, delimiting their areas of perceived responsibility and possibilities for effectiveness, and responding to failure with resignation and rationalization attempts rather than with efforts to respond to the challenge. In short, the more successful teachers achieved greater success in part because they aimed higher and worked more persistently and competently toward reaching their goals than did the less successful teachers.

Other factors associated with teacher success in producing student learning gains included confidence that children would learn if taught properly; willingness to supplement or even change the curriculum if it did not seem to be doing the job (particularly among low SES teachers); systematic collection of information about how children were doing (but typically through observation of group responses and seatwork responses or through informal tests rather than through more formal tests); careful and complete demonstrations of new material and assignments and careful checking to see that children understood how to do assignments before releasing them to work on their own; and a tendency to spend much time with individual children carefully observing their responses, even during group lessons.

SES Differences

Several clear cut differences between teacher behavior successful in high SES schools versus teacher behavior successful in low SES schools appeared. These really should be classified as expected differences, although they will surprise many. However, they are compatible with the literature in child development and education. The difference in appropriateness of difficulty

level of material and in appropriateness of the standardized curriculum already have been discussed. Several other differences appeared also. In general, the more successful teachers working with high SES students taught with a sort of critical demandingness, maintaining high expectations for student performance and responding somewhat critically to students who failed to live up to these expectations. In contrast, the more successful teachers in low SES schools motivated through a combination of patience and encouragement, tending to avoid criticism or punishment for academic failures.

This contrast was quite understandable in view of observed differences in the behavior of the children. High SES classrooms featured eager and confident children who were mostly well motivated and somewhat competitive (often overly competitive) in seeking to answer questions and to get opportunities to respond or otherwise show off their knowledge. In these situations, it was especially important for the teacher to keep order and to insist that everyone respect everyone else's turn. Also, this kind of confident child seemed to respond better to chiding criticism at times when he or she performs clearly below capacity than to praise or encouragement.

In contrast, low SES classrooms were typified by withdrawn and silent children who were uncertain and unresponsive to questions and in need of close supervision of seatwork (because they easily became confused or discouraged). The "blackboard jungle" kind of classroom that appears later in many of these very same schools does not exist yet, because the children are still young and submissive to adult authority. They often are alienated from school, but this alienation shows itself in the form of silence and withdrawal rather than aggression and disobedience. Thus, the teachers' problem in such classrooms is to motivate the students, build their confidence in their own abilities to deal with the material, and in general to get responses from them. Competition and other problems associated with over-

motivation and over-confidence are virtually non-existent. Thus, the kind of criticism that motivates underachievers in high SES classrooms would be devastating here, and instead such children need patience, support, and praise, even for partial successes.

Also, these children needed not only easier and more redundant chunks of information, but also more directive instruction, more repetition, more rote verbal and seatwork exercises, and the like. If the ordinary approaches to teaching a skill did not work, it was imperative for teachers working with such children to repeat them or to try other approaches and keep at it until the children mastered the skill. If the teacher made the mistake of moving on too quickly, before the children mastered an important skill to the point of overlearning, the children would be seriously and perhaps permanently handicapped in their abilities to learn higher level skills which assume these earlier skills as prerequisites. Thus, with the low SES children, teaching had to be not only easier and more redundant, but continued to the point of overlearning in order to make sure that the students clearly mastered the skills and that this mastery would stay with them in the future. This meant covering less material in a school year, but covering the material which was presented in a much more thorough and redundant fashion.

The differences in freedom and independence versus strict teacher directiveness in managing the classroom have been discussed earlier, although it is worth pointing out that the reasons for the differential success are not the ones often given. Aggression, defiance, attention getting behavior, goofing off, and other forms of overt acting out were not the reasons that teachers in low SES schools had to keep a tighter rein on what went on in their classrooms. Instead, it was a matter of the children not yet having developed the work habits and other

abilities that would allow them to benefit from more freedom. In fact, they were still heavily dependent upon the teacher to tell them what to do and how to do it. Thus, low SES teachers had to be more directive not to hold down chaos but to provide students with needed direction. The students in the high SES schools, in contrast, usually had developed more capabilities of assuming independent responsibility, moving freely about the classroom, exercising choice among assignments, and working independently or in cooperative groups. Consequently, teachers in these classrooms could and should have granted the students these opportunities for independent functioning. However, when teachers in low SES schools tried to do this, the result was the kind of frustration and confusion that occurs when people are given responsibilities for which they are unprepared.

Before leaving the topic of SES differences we wish to stress strongly that we look upon SES as a "proxy" variable standing for a complex of student motivation, abilities, and achievement levels. We do not wish to add to the already existing tendency to rely on SES, and we are quite aware that differences within SES are much more impressive than differences across SES. The SES differences are reported here in an attempt to illustrate the kinds of individual differences that must be taken into account and responded to differentially if teachers are to optimize their interactions with all children. Thus, within each type of school there are many students who are best treated the way that the majority of students in the other type of school should be treated. Furthermore, teachers should bear in mind that if they bring along low achieving, dependent children nicely through careful structuring and encouragement, greater redundancy, slower pacing, and the like, these

students eventually will develop to the point where they are capable of benefitting more from teaching which is closer to the optimal for the brighter and more confident students. As these kinds of changes take place in students, appropriate responses should be made by the teacher.

Unexpected Findings

A number of our findings are grouped under this heading because they contradict either previous research or prevailing opinion about good educational practice. We think that the contradictions are not so much real contradictions as they are illustrations of the fact that children in the early elementary grades require a different kind of teaching than children in the later grades. Hence the title of the article. This will be discussed later, however, after presentation of some of these interesting differences. Most of them are concentrated in the areas of public question and answer and discussion situations and in the area of motivation and incentives.

Theory and research concerning teacher questioning strategies and classroom discussions tends to strongly stress several ideas. One is that questions high in conceptual level and complexity are more valuable than simple fact questions with simple right and wrong answers. Another is that the best kind of learning goes on in classrooms where the teacher role is limited primarily to asking questions and otherwise conducting discussions, with most of the classroom talk coming from the students who are responding to the questions and to one another's comments. Some even go so far as to suggest that teacher lecturing is bad and student talk is good under virtually any circumstances.

Our findings flatly contradict all of these ideas. Most variables having to do with verbal interaction in the classroom either did not relate at all to

student learning or related in unexpected ways. Teacher clarity did show a few positive correlations, but only in low SES classrooms. Measures of pupil-to-pupil interaction and use of student ideas correlated negatively with student learning gains. Among the measures which failed to correlate at all were teacher enthusiasm, teacher use of advance organizers, sequencing of lesson structures, attempts to direct attention through embedding questions in the lesson, divergent questioning and the use of higher order questions. Factors which were important in public response situations included teacher directiveness in posing questions and giving instructions, frequent provision of student opportunity to respond as individuals, with teacher monitoring of the answer and provision of immediate feedback (this included both verbal responses and answers on work sheets or workbooks), and a heavy concentration on the fundamentals of reading, writing, and arithmetic accomplished through closed questions demanding short answers or non-verbal answers such as writing a letter or number. The most successful teachers concentrated on this, making sure that each student understood the instructions for the day's assignment clearly before releasing him or her to work on it independently. Furthermore, this vigilance was backed by frequent checking of seatwork in between group instruction periods.

With hindsight, it is not difficult to see why this is so. Theories and research supporting the importance of the verbal interaction variables discussed above have been concerned primarily with students at higher levels. At these levels, teaching boils down to having students read an assignment (typically) and then following it up with some kind of learning experience designed to extend or apply what has been read (discussion, project, etc.). All of this assumes

that the students already have mastered the fundamentals of the three R's and thus are capable of handling the initial learning through reading aspect of the assignment on their own without help or correction. Typically, this assumption is correct, and this it is not surprising that such variables as teacher questioning strategies and the quality of teacher lessons and discussions are important. However, in the early grades, when the children are still heavily involved in mastering the highly motoric fundamental tool skills, these variables of verbally oriented learning of highly abstract or complex material are simply irrelevant. This kind of learning does not go on (presumably appropriately, as will be discussed below) in these grades.

The second major set of surprising findings concerns motivation and incentives. The use of gold stars, smiling faces, and other symbolic rewards did function effectively as reward, correlating positively with learning gains in both low and high SES schools. This seemed to work best when the reward method was combined with the instruction to take the good work home and show it to the parents. In any case, these kinds of symbolic rewards, which have been derided frequently, did in fact function as rewards and were in fact experienced as motivating by the children.

In contrast, teacher praise was not. Praise probably is the most universally recommended teacher procedure, and teacher criticism probably is the most universally denounced one. However, our findings suggest that the situation is nowhere near as simple as this. Earlier considerations about interactions between motivational effects of different teacher reactions on different kinds of children provide guidance to the general kinds of findings that resulted, although there are some interesting elaborations. As a generalized comment, teacher praise simply did not function as a motivating or rewarding behavioral

consequence for children, particularly high SES children. Praise was measured in many different ways and in many different contexts, but in no case did it ever correlate significantly positively with learning gains for high SES students. It did, however, correlate significantly negatively with student learning gains among high SES students on several measures. The most obvious and consistent of these occurred for the measure "teacher praise during student initiated work interactions." In other words, the teachers who most frequently praised students at times when students came up and showed them their work and sought praise tended to be least successful teachers.

Based upon our observers' comments, we believe that the reasons for this are twofold: First, the children who tended to come to the teacher for such praise tended to be the most dependent and teacher oriented children in the class, and the teachers probably were not helping either these children or class morale in general by automatically providing them with praise "on demand," as it were. Second, the praise given in these student initiated interactions tended to be more brief and perfunctory ("That's good, John") than in almost any of the other situations in which praise was observed. Thus, there is reason to believe that praise in this situation was not very motivating even to the children who received it, let alone to the children who observed it.

In contrast to the situation with high SES students, where praise was actually negatively correlated with student learning gains, praise tended to be either uncorrelated or positively correlated with student learning gains in low SES schools, although the number and strength of positive correlations was not nearly as impressive as might have been expected. In any

case, these data fit in with the pattern described previously to the effect that low SES students were dependent and insecure, needing teacher encouragement and praise. Also, contrasting nicely with the finding reported above, praise tended to correlate most strongly when it followed student answers to opinion questions and especially when it occurred during teacher initiated work interactions. Again, observer comments suggested that these instances tended to be the ones in which teacher praise was notably spontaneous, genuine, specific and detailed, and generally likely to function as rewarding the child.

We do not conclude from these data that teachers should stop praising children or that they should praise only their less able children. However, we think that teachers should become much more conscious of their praise and try to make it function effectively as a reward. This means paying careful attention to what they are saying, taking the time to make specific and meaningful comments about the child's work rather than just a perfunctory global statement like "That's good," praising different individuals in different ways calculated to be most satisfying to them personally, praising individuals for their progress relative to where they were in the past rather than for their progress relative to other individuals, etc. Our general impression was that teachers as a group were not very effectively implementing these rather fundamental aspects of effective praise, and we suspect that this is part of the reason that praise did not correlate well with learning gains.

An even more surprising finding was that in high SES classrooms (only), teacher criticism for poor work correlated consistently positively with student learning gains. The apparent reason for this already has been discussed: students who are bright and who are accustomed to success apparently respond

better to chiding criticism when they turn in poor work, do not pay attention, or otherwise fail to do well because they are not trying than they do to attempts to motivate them through praise. Conversely, students who are accustomed to having difficulty in making progress at all do not respond to criticism and require patience and encouragement. Thus, teachers should be aware of these principles, but be very careful and knowledgeable in operationalizing them. The data do not imply that teachers should be quick to criticize children whenever they fail to live up to teacher expectations. Such criticism should be reserved for situations in which the student clearly has done poor work because of lack of effort, and it should be criticism that communicates positive expectations at the same time ("John, you can do a lot better than that. I'm surprised at you. Do it over and do it right this time."), rather than destructive personal criticism.

Before leaving the topic, another important point about criticism findings should be stressed: the positive correlations were confined not only to the high SES schools, but to criticism for poor academic work. Successful teachers generally were warm and student oriented, and the kinds of criticism being discussed here were not highly negativistic criticisms. Nor were they part of a larger pattern of hostility and rejection toward students. Instead, they were a form of high expectations and critical demandingness that these expectations be met, which teachers working with high ability students capable of meeting them tended to use in situations when the students turned in sloppy work or missed part of a lesson because they were fooling around or otherwise acting inappropriately. In contrast to this kind of criticism for poor work, criticism for misbehavior correlated negatively with student learning gains in

both SES groups, as expected, and indicators of negativistic teacher attitudes or behavior also correlated negatively.

A great number of other findings dealing with these and other variables appeared in the study. Interested readers are referred to the book⁸ for a more complete presentation. However, enough data have been presented to allow discussion of the major implications for teacher education and the conceptualization of the teaching process which the present article was designed to address.

Conceptualizing Teaching

In a prominent recent review of research on teaching, Dunkin and Biddle⁹ repeatedly point out that theorists partial to certain ideas or measuring instruments tend to over-stress the importance of the variables included within that theory or measuring instrument. They referred to this as a commitment to a particular idea or related set of ideas. We agree with them on this point, although we look upon it as simply a subset of a more general tendency to conceptualize the act of teaching inappropriately. That is, historically it has been typical for the majority of textbook writers and other prominent writers in education to talk about teaching as if it boiled down to the mastery of a small number of "key" skills (contracting, indirectness, discovery learning, etc.). Upon reflection, it is easy to see that this is grossly inappropriate.

Teaching is, or should be, an applied science in which the practitioner draws upon a vast body of knowledge concerning relationships between types of students, types of learning situations, types of teacher behavior, and types of probable outcomes, selecting from the available alternatives one that is optimally suited to immediate needs. In short, teaching involves the

orchestration of a large number of principles and skills according to the specific needs of the student and the learning situation, and not the consistent application of a small number of "key" skills that are possessed by "good" teachers.

This point is an essentially simple one, and it has been made directly or indirectly by many others previously, particularly those who write about the need for individualized instruction or about interactions between student characteristics and ideal teacher behavior. Nevertheless, we believe that the concept is given more lip service than serious attention, and that there still exists a disturbingly wide tendency to conceptualize teaching as the systematic application of a strikingly small number of principles or skills. So long as individuals with commitments like these continue to write the textbooks used in teacher education programs and to give pre-service and in-service teachers instruction and feedback, little progress can be expected in developing the research base that would provide the requisite knowledge that would enable us to move teaching more quickly and noticeably from an art to an applied science. In short, we need less narrow minded advocacy, more useful research data, and a more realistic conceptualization of what teaching involves.

Teacher Education

Perhaps the most critical (in the sense of fundamental) implications of this research concern the organization of teacher education programs. We believe that considerations derived from developmental psychology (the differences between preoperational children and children who have attained concrete operations, and the implications of these differences for the kinds of experiences optimal for learning), as well as considerations concerning the nature of the

teaching learning situation in everyday school (emphasis on rote learning with lots of redundancy, practice, and feedback related to mastery of the fundamentals of reading, writing, and arithmetic in grades one, two, and three versus complex and often abstract instruction carried on through primarily verbal means from grade four on) suggest that teacher education programs presently are organized inappropriately. We presently make a distinction between primary or elementary school teachers and secondary school teachers.

However, data from developmental psychology and from analysis of what goes on in classrooms suggest that the most fundamental differences in the teaching-learning situation occur between the kinds of activities that occur in the first three grades versus the kinds of activities that go on later. The change in activities in sixth grade versus junior high school or in eighth grade versus high school are relatively minor compared to changes that occur when schooling switches from concentrating on teaching children the fundamentals of the three R's to teaching them other things which assume and involve use of the three R's as tool skills. In addition, our data strongly suggest that the kinds of teaching required in these two situations are radically different. We do not believe that the majority of previous studies of correlates of teaching effectiveness which are contradicted by our work are wrong; nor do we believe that our own work is wrong. Instead, we believe that variables relating to verbal instruction did not assume importance in our research for the pure and simple reason that verbal instruction per se is not very important in the early elementary grades. Had we been studying at higher grades, we probably would have obtained very different results.

This conclusion about the fundamental importance of the contrast between tool skill learning in the early grades versus other learning in later grades has

been reached independently by the British investigator Roy Nash,¹⁰ and he draws similar implications concerning it, both about the need for restructuring teacher education and about the need for building a better research base for teaching in general and for teaching in the early grades in particular. What we are doing at the moment, to put it baldly, is training teachers destined to work in the first three grades to do things which are not only not helpful but sometimes absolutely wrong. They would be right if they were working at higher grade levels, but not for working at the early grades. In short, you do not teach the fundamentals of reading, writing, and arithmetic in the early grades by carrying on discussions; you do it by doing the kinds of things described earlier in this article. We need much more knowledge about the specifics of how to go about doing this, and thus it is important for researchers to concentrate specifically on this task, differentiating clearly between questions having to do with introducing tool skills and developing mastery of them versus questions having to do with using them to learn the kind of abstract content that is taught at higher grade levels.

In any case, with regard to teacher education, it is difficult to exaggerate the need for immediate and serious attention to these matters. At the moment, fresh graduates of teacher training institutions who conscientiously try to apply what they were taught was "right" in their teacher education courses and field experiences are almost certainly going to fail if they are working in the first three grades. Furthermore, if they are assigned to a low SES school, they probably will fail dismally. Unless we change this situation, we are putting these new teachers in a position where they have to either rationalize their failures because we have taught them to do things a certain way and they persist in doing them even if they don't work, or else they have to junk every-

thing that they learned in college and start trying to figure out what to do by consulting other teachers and by learning through trial and error. To put it mildly, this is hardly an intelligent way to prepare teachers.

Also, we need to control commitments to favored ideas or approaches, thus avoiding the mistake of conceptualizing teaching as mastery of a few "key" skills (and passing along this misconception to new teachers). Interactions between the effectiveness of a given teacher practice and such considerations as student age, ability, developmental level, achievement level, and achievement motivation must be considered, along with situational context factors such as type of task, small versus large group instruction, and beginnings versus middles versus ends of units. Most teacher educators give lip service to these complexities, but too many then ignore their implications for conceptualizing teaching and proceed to stress a few "keys to good teaching" instead of the need for orchestration of teaching to meet situational demands. This is ineffective at minimum, and, ironically, it can be destructive for those student teachers who accept what they are taught and try to apply it conscientiously.

Developmental Psychology

Finally, perhaps it is time to seriously question the presumed implications of Piaget and other developmentalists for schooling and teacher education. Self-proclaimed "Piagetians" typically stress skills such as conservation and the need for attention to learning process and comprehension versus rote mastery of "isolated" facts or skills. This has been said so often, it usually is taken as fact. But:

1. Piaget personally has steadfastly refused to discuss educational applications of his work;

2. Conservation and other skills stressed by Piagetians are not strongly affected by environmental intervention and not closely related to school learning, and thus are of dubious relevance to education;

3. Preoperational children have difficulty with comprehension of abstract or complex content, especially if it is presented purely verbally (spoken or written word), but they can master factual knowledge and sensorimotor skills easily through rote learning and practice;

4. Furthermore, despite claims to the contrary, facts and skills taught in the early grades rarely are "isolated" or meaningless;

5. Most children, especially low SES children, still are predominantly preoperational in the early grades, especially when confronting new material (accommodating);

6. Thus, it is reasonable to argue that stress on rote learning and practice of the primarily sensorimotor basics of the three R's is not only appropriate but optimal for children in the first three grades or so!

Conclusion

These comments imply that "Piagetians" are not consistent with either Piaget in particular or developmental psychology in general, and that the teaching methods and curricula, developed historically, which have been used traditionally in our schools, are optimal for all but the brightest and best prepared students. We think that this is in fact the case. Data (as opposed to theory or intuitive advocacy) from the early grades support this position,

despite the present zeitgeist to the contrary.

In any case, we need research to build a data base that teachers can use to draw upon for decision making. It should be clear by now that such a data base will have to be built by individuals who are committed to research rather than to advocacy, and who take into account all of the factors involved in conceptualization teaching as it really is. Also, both to free new teachers from needless confusion and guilt, and to provide them with information they can use, we need greater specificity and realism in teacher education programs for those who will be teaching in the early grades and concentrating on tool skill mastery. This will mean special courses at the very least, and perhaps even separate programs of coursework and practical experiences.

This project was supported by the National Institute of Education Contract OEC 6-10-108, Research and Development Center for Teacher Education, and by Contract NIE-C-74-0089, Correlates of Effective Teaching. The opinions expressed herein do not necessarily reflect the position or policy of the National Institute of Education and no official endorsement by that office should be inferred.

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